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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/920,035	08/01/2001	Kai-Shu Yang	JCLA6567	5486

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EXAMINER

NGUYEN, KIMBINH T

ART UNIT	PAPER NUMBER
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2671

DATE MAILED: 08/01/2003

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/920,035	YANG ET AL.	
	Examiner	Art Unit	
	Kimbinh T. Nguyen	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 August 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 August 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-23 are pending in the application.

Drawings

2. Figures 1-4 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claims 6 and 10 are objected to because of the following informalities:
Misspelling: claims 6 and 10, line 2: replace "each vertices" by--each vertex----; replace "simplifiacion" by --simplification--(claim 6). Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-5, 12-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (6,262,737) in view of Hoppe (6,046,744).

Claim 1, Li et al. discloses constructing a cluster from each vertex in a single resolution mesh constituted of vertices (col. 11, lines 8-10); constructing an expansion operation by connecting the vertex with its adjacent vertices (topological data structure or edge collapse operation, see col. 1, lines 29-31; col. 11, lines 50-63), Li does not teach calculating a cost of expansion (edge collapse operation); however, Hoppe teaches the lowest estimated energy cost of edge collapse operation (a cost of expansion, see col. 24, lines 49-53; fig. 19, #382); repeating the expansion (edge collapse) with the lowest cost for constructing a forest (or progressive mesh) (repeated until no more legal edge collapse transformation, col. 25, lines 45-47), wherein the expansion operation (i,j,k) with the lowest cost, with i, j, k as vertices in the mesh (repeats a loop until the mesh has been simplified, see col. 24, lines 66-67; fig. 19). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the lowest cost estimated energy cost for edge collapse transformation as taught by Hoppe into the clustering single resolution mesh by Li's method for constructing the progressive mesh representation, because it would minimize the energy metric to select successive modifications such as edge collapse transformation, to simplify the mesh to a base mesh (single resolution mesh) while best preserving the mesh's appearance (col. 24, lines 21-24). Li also teaches vertex as a root of the cluster (or preceding vertices or ancestor along the vertex tree, col. 6, lines 10-12) after the connection until the first termination (edge collapse operation) is fulfilled (col. 11, lines 64-67); performing a clustering simplification to each cluster in the forest (progressive mesh), merging (node (vertex) "ne" is added or merged to Q, col. 4, lines

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33-36) non-root vertices (no-ancestor vertex, col. 8, line 2), repeating until the second termination condition (vertex split operation) is fulfilled to produce a simplified mesh (col. 12, lines 55-60).

Claims 2-5, Hoppe discloses obtaining an expansion (edge collapse) with the lowest cost (col. 24, lines 49-53), setting the expansion as disable (the method of edge collapse exits the loop) if the vertex has combined with an expansion (v,u,x) has been carried out, wherein x is any vertex that differ from the vertex in the single resolution mesh (compares the number of faces in the mesh M resulting from the edge collapse is greater than the selected number of faces of the base mesh (single resolution mesh), see col. 25, lines 11-19), recalculating the cost of expansion without carrying the expansion if the cluster (vertices) is combined with other vertices after the expansion (edge collapse) is constructed (col. 25, lines 21-32). **Claims 12-23**, Hoppe discloses saving each round of simplification as a simplification record (figs 12, 14 and 15); converting the simplification record into a refinement sequence (col. 31, lines 39-48); the first termination (edge collapse) and the second termination (vertex split) are deduced from a condition between levels in an user-defined resolution mesh (the software application selects the coarser and finer meshes of level-of-detail by the computer user (col. 14, lines 53-60; col. 24, lines 54-65). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the lowest cost estimated energy cost for edge collapse transformation as taught by Hoppe into the clustering single resolution mesh by Li's method for constructing the progressive mesh representation, because it would minimize the energy metric to select

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successive modifications such as edge collapse transformation, to simplify the mesh to a base mesh (single resolution mesh) while best preserving the mesh's appearance (col. 24, lines 21-24).

6. Claims 6-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (6,262,737) in view of Hoppe (6,046,744) and further in view of Taubin et al. "Progressive Forest Split Compression", IBM T.J. Watson Research Center (ACM, published July 1998, pages 1-10).

Claims 6-11, Taubin et al. discloses the vertex *t* is combined with each vertex outside the vertex *t* when the clustering simplification is performed (each connected component is a simple polygon (triangulated with no internal vertices), see section "The forest collapse operation", the right column of page 7); eliminating the triangles using two or more vertices in the cluster (all vertices in each cluster are collapsed into a single vertex of the next level of detail, clustering algorithms are based on triangle collapsing and edge collapsing, see section "Clustered multi-resolution models", the right side column of page 7); moving the corner of the triangle (jumping from triangle corner to neighboring triangle corner) which uses a non-representative vertex in the cluster to where the representative vertex is located (see the left column (the top paragraph) of page 5). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the clustering simplification or applying the forest split operation taught by Taubin into single resolution model of Li's method for constructing a progressive mesh, because it would implement the single resolution

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compression rates as the size of the forests grow and the vertex displacement decrease in magnitude (see the last paragraph of the left column of page 9).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Rossignac et al. (5,825,369) discloses compression of simple geometric models using spanning trees.
- Gueziec et al. (6,307,551) discloses method generating and applying changes in the level of detail of polygonal surface.
- Taubin et al. (6,009,435) discloses processing compression of clustered multi-resolution polygonal models.
- Junkins et al. (6,198,486).

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Kimbinh Nguyen** whose telephone number is **(703) 305-9683**. The examiner can normally be reached **(Monday- Thursday from 7:00 AM to 4:30 PM and alternate Fridays from 7:00 AM to 3:30 PM)**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (703) 305-9798.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

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Washington, D.C. 20231

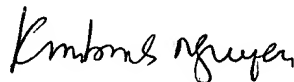
Or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Part II, 2121 Crystal Drive,
Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or
proceeding should be directed to the Technology Center 2600 Customer Service Office
whose telephone number is (703) 306-0377.

July 28, 2003



Kimbinh Nguyen

Patent Examiner AU 2671